



双语教材

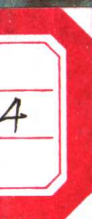
学英语 · 学科学

中央教育科学研究所外语教育研究中心推荐双语教材

# 物质科学 (初级版)

## Janus Physical Science

(美) Cary I. Sneider 等著



机械工业出版社  
China Machine Press





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## Janus Physical Science

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# 出版说明

人们关于教育是否是一种科学的争论一直都在进行中，但无可质疑的是，教育离不开科学，不仅教育作为一种活动必须符合科学规律，同时人也需要接受科学教育——人必须有追求科学的精神和追求科学的能力。本着这种精神以及满足国内广大师生较高层次的英语学习需要的宗旨，北京华章图文信息有限公司精选并影印出版了多套外国优秀科学教育系列教材，以供各级外语特色学校和双语学校作为选修教材之用，当然也可作为英语爱好者自学的素材。这些原版的科学学习教材创造了一种学科英语的环境，学生不仅能在其中学到学科知识，更锻炼了用英语进行思维、表达的能力，这为他们以后阅读外文专业书刊、成为科学家以及各个领域的专业人才打下良好的基础。

学英语·学科学丛书之初级版，包括地球科学（太阳系、变化的地球、天气和地球资源，共4个单元）、物质科学（能源、电、声音和机器，共4个单元）和生命科学（绿色植物、动物、人体系统和人的五种感觉，共4个单元）三本。各单元包括引言、主题研究、学习结果的展示等几大部分，其中的主题研究还有引言、重点词汇等。这套教材的整体设计不仅保证了基本科学知识的全面性，还考虑到所学知识与现实生活的联系，从学生生活经验出发，让学生不仅爱学科学，还能轻轻松松地学好科学。在这里，科学既包括对学生科学思维的训练、科学认识的提高和科学技能的培养，又包括在科学探索过程中对学生科学探索情感、态度、价值观的熏陶，科学探索的过程和结果在本系列中获得了同样重要的地位。

初级版的显著特点是：

强调学习者的亲身体验，让学生通过想像、观察、记录等科学研究过程来发现身边的科学，具有极强的可操作性。

所有科学概念都被细化成一个小一个的小单元，易于学生逐步掌握。

活动和实验简单但却引人入胜，所用操作材料熟悉而方便。

观察、记录、分析、总结和预测等过程能够让学生掌握解决问题的策略，发展批判性思维。科学探索的过程和结果并重。

学英语·学科学丛书不仅能使学生在特创的学习环境中了解很多已经被科学家发现或证明了的事实和道理，还能让学生用科学家们探索科学的方法，通过实验、观察和记录来了解我们周围的世界。

让我们跟着科学家的步伐去探索科学的奥秘吧！

北京华章图文信息有限公司  
外语编辑部

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## Introduction

In this book, you will learn about some of the things that scientists study. You will learn some of the things that scientists have discovered. You will explore and discover facts the same way scientists do, by experimenting, observing, and recording. And you will learn scientific information about the world that you can use right away.

# Forces in Our World

Physical science is the study of the forces in our world. You need those forces to stay alive. And you can use the forces to make your life better.

Before people understood the forces in the world, their life was much harder than our life is today. Before people knew how to make fire, they weren't able to cook their food or heat their homes. Before machines were invented, work was much harder.

Physical scientists study the forces in our world. They have learned some of the ways those forces work. And they have discovered ways we can use those forces to make our life better.

Scientists have discovered how energy, such as electricity, works. You use energy to light your house or to travel from one place to another.

Scientists have discovered how sounds are made and how sounds travel. You can listen to music or talk on the telephone because of what scientists have discovered about sound.

And scientists have invented machines for you to use. You can move heavy things or cut the grass because of what scientists have learned about how machines work.

In this book, you'll learn about different forces in our world. As you study those forces, you'll use the same methods that scientists use: You will observe how the forces work and record what you learn. And you will learn some of the ways you can control those forces to make your life better.





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# ENERGY

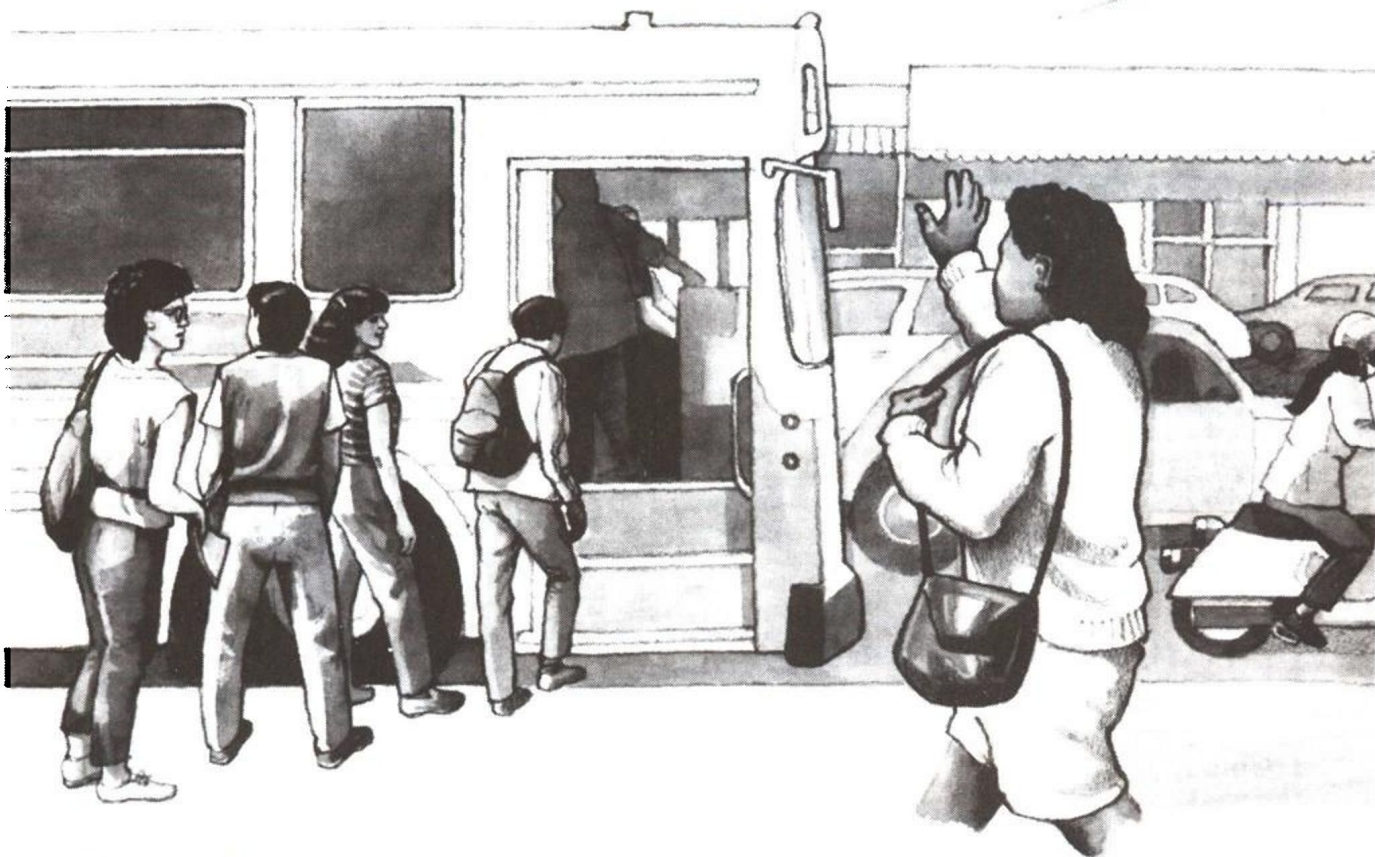
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What kind of force is energy? What kinds of energy do we use? Where does that energy come from? How do we use energy? How can we save energy so that it doesn't run out? In this section, you'll learn many facts about energy. And you'll learn about the important part energy plays in our lives.

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## Introduction

Picture this:

It's late afternoon. It is time to go home, and you're waiting for a bus.

You look around. Cars and buses fill the street. Motorcycles roar by. An airplane flies overhead.

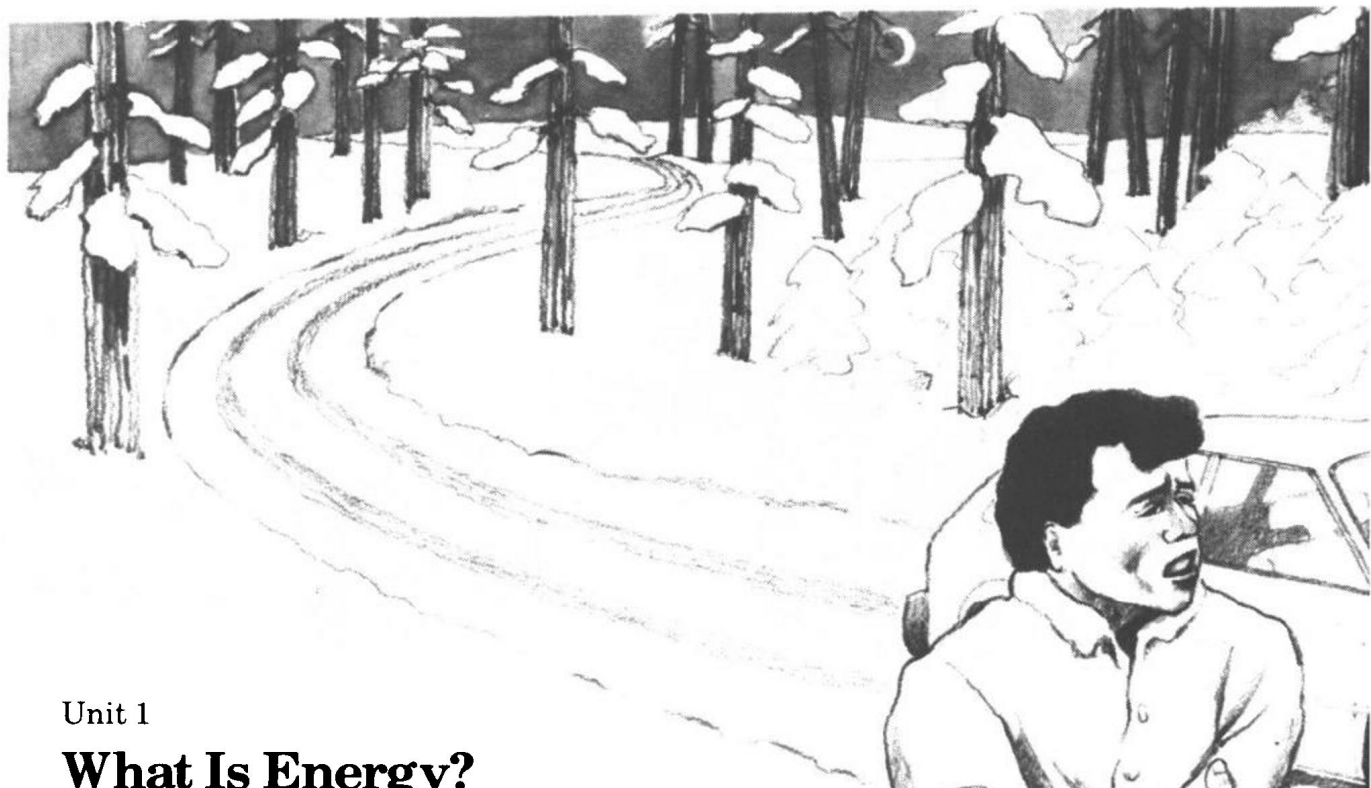
The sun sets, and you feel cold. You put on your sweater. Street lights come on. Lights in buildings come on too.

Your bus pulls up, and you get on. Soon you'll be home. You'll turn on the heater and warm your house. You'll cook your dinner, then watch TV. At bedtime, you'll set the alarm on your electric clock.

All those things take energy. Energy moves the cars, buses, motorcycles, and airplane. Energy gives you light and heat. Energy runs your TV and clock.

Energy is all around us. We use it to make our lives easier and more comfortable. We use it to make things and to do work. We use it to keep ourselves alive. Can you imagine living without any energy at all?

This section is about the energy you use. You'll find out where that energy comes from. You'll learn how it is used. You'll see how important energy is in your life. And you'll also learn ways to use energy wisely.



## Unit 1

# What Is Energy?

You use energy in many different ways. You use it to cook your food. You use it to get to school or work. And you use it to light up a dark place. In fact, you use a *lot* of energy every day.

Even though you use energy all the time, you probably don't think about it much. But without energy, you could not live. Energy is all around you. You use many kinds of energy.

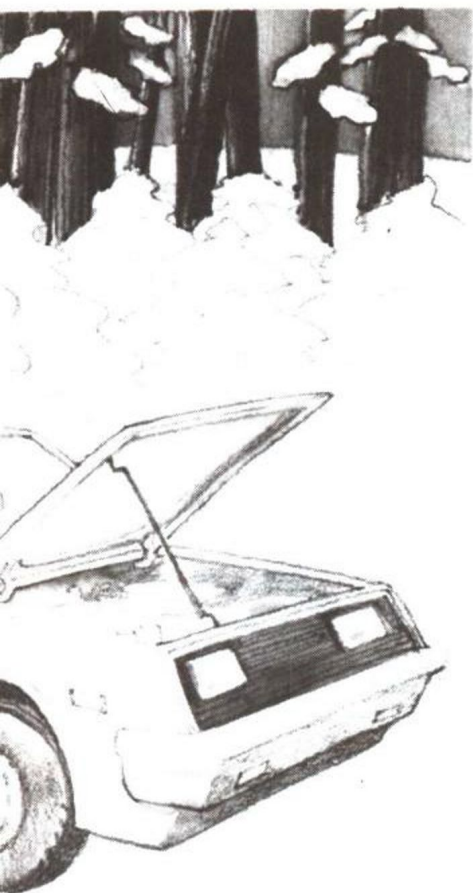
- What are some kinds of energy?
- How do you use energy?
- Where do you get energy?

You'll learn the answers in this unit.

## Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary that's at the back of this book. On a separate piece of paper, write what the words mean.

1. **motion**
2. **stored**



## Stuck in the Woods!

Picture this:

You're driving down a road. Your car is moving along. It's in *motion*.

The sky starts to get dark. Night is coming. You can't see the road very well, so you turn on the car's headlights. They *light* the road.

Now it starts to snow. You're getting cold. You turn on the car's heater. It sends *heat* into the car. Soon you are nice and warm.

You're now using three kinds of energy. What do you think they are?

Right! Motion, light, and heat are the three kinds of energy you're using.

All of a sudden, your car stops! Your lights go out, and your heater stops working. You can't get the car to start up again. You are cold, you have no light, and you are stuck in the woods. You have an energy problem! What would you do?

That's an example of what could happen when you can't get motion, light, and heat energy. They are three kinds of energy you use every day. Without them, your life could be very hard. What would your life be like if you didn't have motion, light, and heat energy?



## What Gives You Energy?

You learned that heat, light, and motion are kinds of energy. What are some things that give you those kinds of energy?

### Heat Energy

Name something that gives off heat to warm you.

Name something that gives you heat to cook with.

### Light Energy

Name something that gives you light indoors.

Name something that gives you light outdoors.

Name something you can carry that gives you light.

### Motion Energy

Name something that moves you from home to school or work.

Name something that moves you on a river, lake, or ocean.

Name something that helps people move heavy things.



# Changing Energy

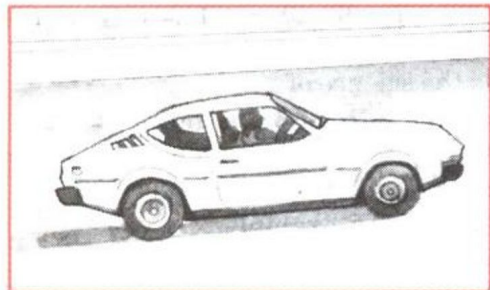
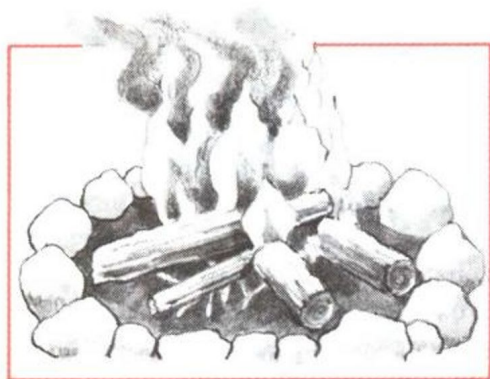
Think of a piece of paper. Does it have motion, heat, or light energy?

It doesn't have any of those kinds of energy. But it can! That's because paper has **potential energy**. Potential energy is a kind of energy that is stored inside of something.

Scientists say that energy cannot be made. It can only be *changed* from one kind of energy into another kind. How can the potential energy in paper be changed into light energy?

Right! When you burn paper, the potential energy inside it is changed into light energy. It is also changed into heat energy.

The pictures on this page show some things that had potential energy. What kinds of energy did that potential energy change into? Answer the questions. Then check your answers. (The right answers are upside down.)



1. Wood has potential energy. When you burn wood, the potential energy is changed into what two kinds of energy?  
a. heat                      b. light                      c. motion
2. Gasoline has potential energy. When you drive a car, the engine burns gasoline. The car moves. The potential energy in gasoline is changed into what kind of energy?  
a. heat                      b. light                      c. motion
3. A battery has potential energy. When you use it in a flashlight, that potential energy is changed. What kind of energy is it changed into?  
a. heat                      b. light                      c. motion

## Answers

1. We burn wood to get heat and light energy.
2. We get motion and heat energy when we burn gasoline.
3. We get light and heat energy when we use a battery in a flashlight.

## Review

Use what you learned in this unit. Match the words in the list below with their meanings. The page number after each meaning tells where you can find the word.

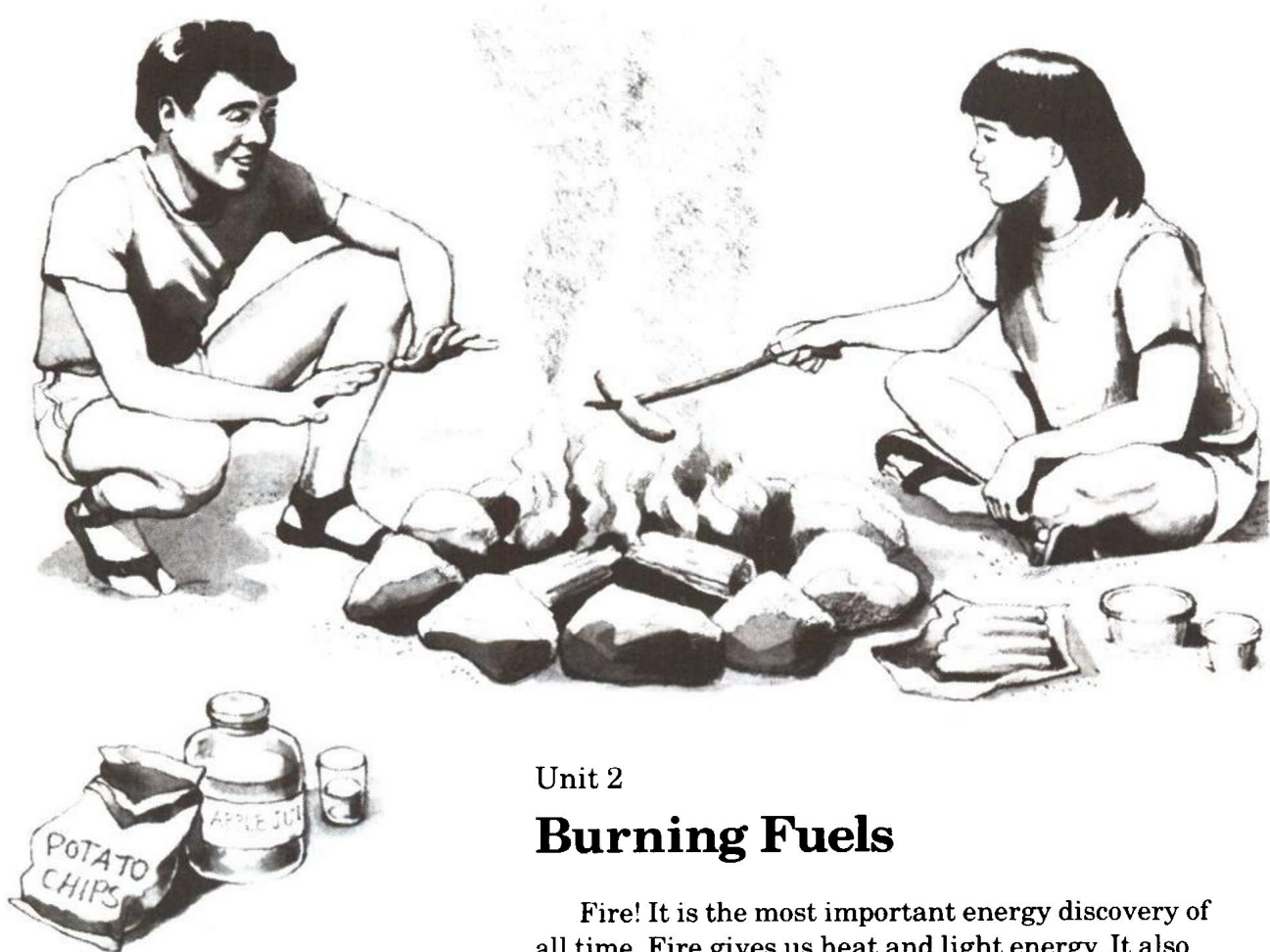
potential	motion
heat	light

1. A kind of energy that can move things (page 7)
  2. A kind of energy that helps you see things (page 7)
  3. Stored energy that is waiting to be used (page 9)
  4. A kind of energy that can cook food (page 7)
- 

## Check These Out

1. **Make a Science Notebook for Energy.** Keep a list of your glossary words and their meanings in your notebook. Also keep a record of the experiments you do. You can also put anything else you learn about energy in your Science Notebook.
2. Find out more about how energy works in a car. Ask a mechanic to talk to your class. Ask the mechanic these questions: How does the car's heater work? Where do the headlights get their energy? How does the engine work?
3. Look through some magazines. Find pictures that show energy being used. Cut them out and put them in these three groups: heat, light, and motion. Make posters of the three groups.
4. Food gives people energy to move. This energy is measured in *calories*. Find out how many calories certain foods have. Get a food calorie chart from a library. Or look at the labels on cans and other food packages. Those labels often list the number of calories in the food. Bring those labels to class.
5. As you work through this section, you may want to find out more about energy. You can find out more by looking in a dictionary or an encyclopedia, or by getting books about energy from a library. You can also talk to an expert, such as a physics teacher, someone at a utility company, or someone at an ecology center.  
Here are some things you may want to find out:
  - What is the science of thermodynamics? How do engineers use this science?
  - What does *conservation of energy* mean? Give some examples.
  - What is horsepower?
  - What kinds of energy did cave people use? What kinds of energy do people use today?





## Unit 2

# Burning Fuels

Fire! It is the most important energy discovery of all time. Fire gives us heat and light energy. It also gives us motion energy.

But in order to have a fire, something must burn. We burn many different things every day. They are our most important sources of energy.

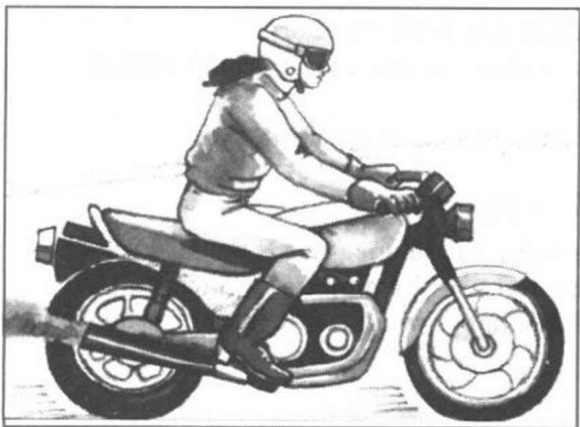
- What do people burn for energy?
- How do people use the energy from burning things?

You'll learn the answers in this unit.

## Before You Start

You'll be using the science words below. Find out what they mean. Look them up in the Glossary. On a separate piece of paper, write what the words mean.

1. **engine**
2. **fuel**



## Energy from Fuel

We call things that we burn *fuel*. A good fuel has a lot of potential energy stored in it. When we set that fuel on fire, the fire changes its potential energy into heat, light, or motion.

The pictures show some fuels being burned. They are fuels people use every day. Look at the pictures and answer the questions. Then check your answers. (The right answers are upside down.)

1. The people in the top picture are having a barbecue. What fuel are they burning?

What energy is that fuel giving?

2. The power went out in the middle picture. The lights don't work. What fuel are the people burning?

What energy is that fuel giving?

3. The woman in the bottom picture is riding a motorcycle. The motorcycle has an engine. The engine works by burning fuel. What fuel is the engine burning?

The engine changes some of the potential energy of the fuel into another kind of energy. What kind is it?

## Answers

1. People burn charcoal to get *heat* energy.
2. People burn candle wax to get *light* energy.
3. The engine burns gasoline and gets *motion* energy.

# The Right Fuel for the Job

People use different fuels for different jobs. Some fuels are used for light. Some are used for heat. And some are used for motion.

The pictures on this page show six fuels that are being used for different reasons.

1. Which two fuels are being used for light?
2. Which two fuels are being used for motion?
3. Which two fuels are being used for heat?

